Miniaturized droplets-based microarray of chemical and biological high-throughputl tests.

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The development of high-throughput and combinatorial technologies is helping to speed up research that is applicable in many areas of chemistry, engineering and biology. We propose a simple, versatile high-efficient and new superhydrophobic platform, which permits to arrange of quasi-spherical aqueous-based droplets with the capability to support and monitor a series of chemical/biological reactions on a lab-on-chip scale. Superhydrophobic biomimetic surface based on so-called lotus effect were produced onto which array of microindentations to fix liquid droplets, based on the rose petals effect. Such platforms sustain stable arrays of droplets with microliter volumes allowing to isolate and confine different combinations of biological materials. We demonstrate that it is possible to add agitation capability using magnet microspheres, enabling to create mechanical stress inside the microliter-size droplets. Different experiments were also performed to demonstrate the suitability of the developed platform, including: (i) the efficacy of the mechanical agitation in a simple physical process, namely by following the dissolution of salt crystals inside the droplets; (ii) the monitoring of a chemical reaction, namely the crosslinking of chitosan with genipin with different concentrations of reagents; (iii) the evaluation of cell viability under different pHs; (iv) the evaluation of the cytotoxicity of drugs in cells spheroids, developed by gravity in the suspended droplets. Such technology has potential to be used in many biomedical applications, such as drug screening and biomaterials development.